

AMENDMENTS TO THE DRAWINGS

The attached sheet(s) of drawings includes changes to Figures 1, 2, 3, 8, and 9.

Attachment: Replacement sheets (4)

REMARKS

The present amendment is in response to the Office Action mailed June 2, 2005, in which Claims 1-27 were rejected. Applicant has thoroughly reviewed the outstanding Office Action including the Examiner's remarks and the reference cited therein. The following remarks are believed to be fully responsive to the Office Action and render all claims at issue patentably distinguishable over the cited references.

Reconsideration and withdrawal of the rejections set forth in the Office Action mailed June 2, 2005 are respectfully requested.

I. Drawings

Applicant has amended Figures 1, 2, 3, 8 and 9 of the present application to eliminate the label 2. Thus, the objections of the drawings are overcome.

II. Claim Rejections - 35 U.S.C. § 103(a)

Regarding Claims 1 and 19, the system defined therein utilizes a long period fiber grating (LPFG) as a sensor. Helmig merely uses a fiber Bragg grating (FBG). The differences between the characteristics of the LPFG and that of the FBG lead to the usage of LPFG that greatly increases temperature resolution. As known to the person having ordinary skill in the art, the temperature sensitivity of the LPFG is about 300 pm/°C, but that of the FBG is only about 10 pm/°C.

Figure 4 of the present application, which illustrates the exemplary results of measurement, show that the resolution of temperature measurement of the invention defined in Claims 1 and 19 is improved by thirty times than that of Helmig. Such improvement is believed to be significant to the field of the technology, and the prior art could not expected such remarkable effect. The use of an LPFG causes disproportionate and surprising results, so the invention defined in Claims 1 and 19 are unobvious and patentable.

Since Claims 2-9 and 20-27 respectively depend on Claims 1 and 19, they should be patentable under the patentability of Claims 1 and 19.

Regarding Claim 10, the roles of the LPFG and the FBG are interchanged. As the invention is defined in Claim 10, the LPFG is utilized as the modulator and the FBG is utilized as the sensor. With this arrangement, the temperature range that could be measured would become much wider, because the difference in the no-pass band (0.175 nm for FBG and 39.5 nm for LPFG).

As seen in FIG. 5 and FIG. 6 of Helmig, the usable temperature range is about 20 to 30 °C. However, with the arrangement defined in Claim 10 and illustrated in Figure 8, the measurable temperature could achieve to 600 °C. Such performance is unexpected to the prior art, and the invention defined in Claim 10 could cause disproportionate and surprising results. Consequentially, the invention defined in Claim 10 is unobvious and patentable.

Moreover, according to Helmig, in the situation that the sensor and the modulator are both FBGs, the available wavelength range changes that can be detected is extremely limited. This not only restricts the measurable temperature changes, but also makes the usage of FBG to sense other physical properties or parameters impracticable due to the small usable range. The invention defined in Claim 10 applies LPFG as the modulator, and the measurable range therefore becomes much wider so that a great number of physical parameters could be measured directly or via suitable transducer mechanisms.

As mentioned in Helmig, the deformation mechanism is employed to enlarge the range of measurement. However, the enlargement is still limited because the allowable amount of deformation is restricted by the brittle fracture strain of the glass fiber, and a much more complicated device has then to be introduced to perform, control and sense the deformation. Thus, the claimed invention in Claim 10, which uses the LPFG as the modulator, could decrease the cost, simplify the structure and promote reliability. These advantages are clearly unexpected to the prior art, so the invention defined in Claim 10 is unobvious and patentable.

Since Claims 11-18 respectively depend on Claim 10, they should be patentable under the patentability of Claim 10 as well.

Regarding Claims 2, 11 and 22, the surface corrugated type LPFG is sensitive to torsion and bending, but is insensitive to the surrounding refractive index changes. This feature could greatly enlarge the scope of measurement as well as provide much more flexibility than merely employing FBG as the sensor. Therefore, the change of sensor could therefore cause unexpected results. The inventions defined in Claims 2, 11 and 22 are unobvious and patentable.

Regarding Claims 8, 17 and 24, the inventions defined therein use the 980 nm laser light through WDM into EDFA to generate an amplified spontaneous emission as well as forming a lasing cavity between the FBG and the mirror 11. In this way, a much stronger light source would be obtained than other arrangements. Additionally, a more accurate measurement would be ensured and the signal could be transmitted over a much longer distance without degrading the measuring capability. The system disclosed by Helmig has lower sensitivity and limited measurable range, so it is unnecessary for Helmig to adopt such a high quality light source. Accordingly, there is no motivation could be found or expected in Helmig's disclosure to apply such arrangement. Thus, the inventions defined in Claims 8, 17 and 24 are unobvious and patentable.

As a result, the rejections of Claims 1-27 under 35 U.S.C. 103(a) are believed to be overcome.

III. Conclusion

In view of the foregoing, Claims 1-17 pending in the application comply with the requirements of patentability define over the applied art. A Notice of Allowance is, therefore, respectfully requested.

Applicant believes no fee is due with this response. However, if a fee is due, please charge our Deposit Account No. 50-0665, under Order No. 386998047US from which the undersigned is authorized to draw.

Dated:

8/30/05

Respectfully submitted,

By 

Chun M. Ng

Registration No.: 36,878

PERKINS COIE LLP

P.O. Box 1247

Seattle, Washington 98111-1247

(206) 359-8000

(206) 359-7198 (Fax)

Attorney for Applicant

Attachments